

REMARKS

Applicant requests favorable consideration and allowance of the subject application in view of the preceding amendments and the following remarks

Claims 39 and 41-51 are now presented for examination. Claims 43 and 50 have been cancelled without prejudice or disclaimer of subject matter. Claims 39, 44, 46 and 49 have been amended to define still more clearly what Applicant regards as his invention, in terms which distinguish over the art of record. Claim 51 has been added to assure Applicant of the full measure of protection to which he deems himself entitled. Claims 39 and 51 are the only independent claims.

Claims 46 and 49 have been rejected under 35 U.S.C. § 112, second paragraph, as being indefinite in that the phrase “nearly free” in claim 46 is vague and does not provide a standard for ascertaining the requisite degree and in that it is unclear as to which type of chamber the “chamber” in line 4 of claim 49 refers.

Claim 46 as currently amended recites "so that an occurrence of degassing of the outer pipe is less than that of the inner pipe" rather than the objected to "nearly free from degassing". Claim 49 has been amended to recite "the chamber" which refers to the chamber set forth in independent Claim 39 as currently amended. Accordingly, it is believed that Claims 46 and 49 as currently amended fully meet the requirements of 35 U.S.C. § 112, second paragraph.

Claims 39, 43-47 and 49 have been rejected under 35 U.S.C. § 103 as being unpatentable over U.S. Patent No. 6,110,274 to Okuno in view of U.S. Patent No. 4,906,496 to Hosono et al. Claim 48 has been rejected under 35 U.S.C. § 103 as being unpatentable over the Okuno patent in view of the Hosono et al. patent, as above, and further in view of “design

choice.” Claim 41 has been rejected under 35 U.S.C. § 103 as being unpatentable over the Okuno patent in view of Hosono et al. patent as applied to claim 39 above, and further in view of U.S. Patent No. 5,837,316 to Fuchita. Claim 42 has been rejected under 35 U.S.C. § 103 as being unpatentable over the Okuno patent in view of the Hosono et al. patent as applied to claim 39 above, and further in view of U.S. Patent No. 4,368,219 to Nagata et al. With regard to the claims as currently amended, these rejections are respectfully traversed.

Independent Claim 39 as currently amended is directed to a pipe structure in which a double pipe has a resin inner pipe and a resin outer pipe covering the outside of the inner pipe. A vacuum pump discharges gas in the space between the inner pipe and the outer pipe. The double pipe is in a chamber. The pressure in the space between the chamber and the outer pipe is less than the pressure in the space between the inner pipe and the outer pipe and the pressure in the space between the inner pipe and the outer pipe is less than the pressure in the inner pipe.

In Applicant's view, Okuno discloses An arrangement that produces a high-quality polycrystalline semiconductor ingot with excellent crystallographic properties. The interior of an airtight vessel is kept in an inert atmosphere for semiconductors. A raw semiconductor material is charged in a crucible, and the raw semiconductor material is heated by an induction heating coil so as to be melted. Then the bottom of the crucible is deprived of heat for causing the raw semiconductor material to solidify, thereby producing a polycrystalline semiconductor. The semiconductor crystal grows in one direction from the bottom to the top of the crucible while the heat emission is changed in accordance with a predetermined relationship for keeping the solidification rate of the raw semiconductor material constant. The arrangement includes a

pedestal having a hollow double structure which is equipped with a cooling section and a feeding cylindrical member formed as a double pipe.

In Applicant's opinion, Hosono et al. discloses a double-walled tube assembly that has an elongate inner tube of thermoplastic resin, and an elongate extruded outer tube of thermoplastic resin including a plurality of ribs having a constant height longitudinally of the outer tube and extending over the entire length of the outer tube. The ribs project toward the center of the outer tube. The ribs have distal ends fused to the outer peripheral surface of the inner tube over the entire length of the inner and outer tubes. The rib width is from 0.5 to 1.5 mm. To continuously manufacture the double-walled tube assembly, the pre-molded inner tube is fed to an extrusion molding machine having a cross-head die, and thermoplastic resin is extruded from the cross-head die into an elongate outer tube around the inner tube. The inner tube and the extruded outer tube are fed into a sizing die device, in which the outer tube in a softened state is contracted toward the outer peripheral surface of the inner tube until the distal ends of the ribs of the outer tube are fused to the outer peripheral surface of the inner tube.

According to the invention defined in Claim 39 as currently amended, a vacuum pump discharges gas in a space between the inner resin pipe and the outer resin pipe of a double pipe structure. The double pipe is in a chamber with the pressure in the chamber-outer pipe space being less than the pressure in the inner pipe-outer pipe space and the pressure in the inner pipe-outer pipe space being less than the pressure in the inner pipe. Advantageously, the vacuum discharge of the gas in the inner pipe outer pipe space substantially reduces any gas leak from the inner pipe space to the chamber space while maintaining suitable flexibility for bending the pipe structure.

Okuno may disclose a pedestal having a hollow double pipe structure through which a cooling medium is forcedly circulated to cool a supporting bed on a pedestal. In Okuno, the cooling medium is supplied by a cooling medium tank 15 through a valve 26 controlled according to a temperature differential at an inlet and an outlet of the double pipe structure. The Okuno disclosure which requires forced circulation of a cooling medium, however, is devoid of any teaching or suggestion of a vacuum pump discharging gas in a space between an inner pipe and an outer pipe of a double pipe.

Further, the forced circulation in Okuno is performed to provide minimum pressure differential along the cooling medium path. Accordingly, the insignificant pressure differential all along the path required by Okuno to provide maximum cooling is completely distinguished from and directed away from the feature of Claim 39 of the pressure in the space between the inner pipe and the outer pipe created by the vacuum pump gas discharge being less than the pressure in the inner pipe space. Accordingly it is not seen that Okuno in any manner teaches or suggests the feature of Claim 39 of a vacuum pump for discharging gas in the space between the inner pipe and the outer pipe combined with the features of the pressure in the space between the chamber and the outer pipe being less than pressure in the space between the inner pipe and the outer pipe, and the pressure in the space between the inner pipe and the outer pipe being less than the pressure in the inner pipe in a double pipe structure in a chamber.

Hosono et al. may disclose a double walled tube assembly that passes different gases separately there through with a space between a resin inner pipe and a resin outer pipe coupled to an opening so that a fluid under pressure flows through each of the inner and outer pipes. The Hosono et al. disclosure, however, is devoid of any suggestion of a vacuum pump that discharges

gas in the space between the inner pipe and the outer pipe as in Claim 39. Further, there is no suggestion in Hosono et al. of the pressure in the space between the inner pipe and the outer pipe being less than the pressure in the inner pipe space as in Claim 39.

With regard to the cited combination, neither Okuno nor Hosono et al. in any manner teaches or suggest the feature of Claim 39 of a vacuum pump discharging gas in the space between an inner pipe and an outer pipe of a double pipe in a chamber. In addition, neither of these references in any manner suggests the feature of the pressure in the space between the inner and outer pipes resulting from the vacuum pump discharging being less than the pressure in the inner pipe space as in Claim 39. Accordingly, it is not seen that the addition of Hosono et al.'s resin inner pipe and resin outer pipe devoid of any suggestion of a vacuum pump discharge of gas in the inner pipe-outer pipe space or pressure in the inner pipe-outer pipe space being less than the pressure in inner pipe space to Okuno's forced cooling medium flow in a path through the inner pipe and the outer pipe of a double pipe structure arranged to minimize pressure differences in the flow for maximum cooling but without a vacuum pump discharging gas could possibly suggest the features of Claim 39. It is therefore believed that Claim 39 as currently amended is completely distinguished from Okuno, Hosono et al. and any combination thereof and is allowable.

New independent Claim 51 is directed to a pipe structure in which a double pipe has a resin inner pipe and a resin outer pipe covering the outside of the inner pipe and a vacuum pump that discharges gas in a first space between the inner pipe and the outer pipe. The double pipe is in a chamber. The pressure in a second space between the chamber and the outer pipe is less

than the pressure in the first space and the pressure in the first space is less than the pressure in a third space in the inner pipe. The first, second and third spaces are independent of each other.

The feature of the first, second and third spaces being independent of each other is shown at least in Fig. 1 and is disclosed in the corresponding portions of the specification. No new matter is believed to have been added.

As discussed with respect to Claim 39, Okuno only teaches forced circulation of a cooling medium in a path through an inner pipe and an outer pipe of a double pipe structure but is devoid of any teaching or suggestion of the feature of Claim 51 of a vacuum pump discharging gas in a space between an inner pipe and an outer pipe of a double pipe. Further, the inner pipe space and the inner pipe-outer pipe space in Okuno are connected as part of a cooling path. It is another feature of Claim 51 that the inner pipe space and the inner pipe-outer pipe space are independent. Accordingly, it is not seen that Okuno's cooling path connection between the inner pipe and the outer pipe in any manner suggests that the inner pipe space is independent of the inner pipe-outer pipe space as in Claim 51.

Hosono et al., as discussed with respect to Claim 39, only teaches a resin inner pipe and a resin outer pipe with different fluids therein but is devoid of any suggestion of a vacuum pump discharging gas from the inner pipe-outer pipe space or that the pressure in the inner pipe-outer pipe space is less than the pressure in the inner pipe space. As a result, it is not seen that the addition of Hosono et al.'s resin inner and outer pipes devoid of any suggestion of a vacuum pump discharge arrangement for the inner pipe-outer pipe space or the pressure in the inner pipe-outer pipe space being less than the pressure in the inner pipe space to Okuno's cooling path with an inner pipe being connected to an outer pipe devoid of any suggestion of a vacuum pump

discharge of an independent inner pipe-outer pipe space could possibly suggest the features of Claim 51. It is therefore believed that new Claim 51 is completely distinguished from any combination of Okuno and Hosono et al. and is allowable.

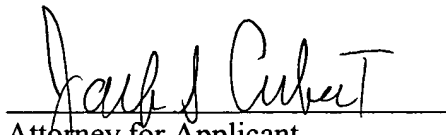
Applicant submits, therefore, that the cited art does not teach or suggest the salient features of Applicant's present invention, as recited in independent claims 39 and 51. Accordingly, Applicant submits that the present invention, as recited in independent claims 39 and 51, is patentably defined over the cited art.

Dependent claims 41, 42 and 45-49 also should be deemed allowable, in their own right, for defining other patentable features of the present invention in addition to those recited in independent claim 39. Individual consideration of these dependent claims is requested.

Applicant submits that the instant application is in condition for allowance. Favorable reconsideration and an early Notice of Allowance are requested.

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Respectfully submitted,



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